

Work stress and job performance

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Work stress is defined as the harmful physical and emotional responses that occur when job requirements do not match the worker's capabilities, resources, and needs (National Institute of Occupational Safety and Health 1999). It is recognized world-wide as a major challenge to individual mental and physical health, and organizational health (ILO 1986). Stressed workers are also more likely to be unhealthy, poorly motivated, less productive and less safe at work. And their organizations are less likely to succeed in a competitive market. By some estimates work-related stress costs the national economy a staggering amount in sick pay, lost productivity, health care and litigation costs (Palmer et al. 2004).

Work stress can come from a variety of sources and affect people in different ways. Although the link between psycho-social aspects of the job and the health and well-being of workers has been well documented (Dollard and Metzger 1999), limited work has been done on the effects of distinct stressors on job performance. As well, various protective factors can prevent or reduce the effects of work stress, and little research has been done toward understanding these mitigating individual and organizational factors.

One important source of work stress is job strain. According to the demand/control model (Karasek 1979), job strain is determined by the interactions between psychological demands and decision latitude (see *Work stress*). The first dimension, the psychological demands on the worker, relate to pace and intensity, skills required, and the ability to keep up with colleagues. The second dimension relates to the degree of creativity versus repetition, as well as the extent of freedom and responsibility to decide what

to do and when to do it (Lindström 2005). Four work environments can then be derived: high-strain jobs, active jobs, low-strain (relaxed) jobs, and passive jobs (see *Psychological demand/decision latitude model*).

Though simple identification of low- and high-strain jobs may be important, the distinction between job control and psychological demands must be retained because each category can have different effects on workers and their organizations. For instance, when job control is high and psychological demands are also high, learning and growth are the predicted behavioural outcomes. Much of the energy aroused by job challenges can be translated into direct action—effective problem solving—with little residual strain. The growth and learning stimuli are conducive to high productivity. On the other hand, low demand and low control lead to a very unmotivating job setting, which results in gradual loss of previously acquired skills (Karasek 1998).

Psychological demand/decision latitude model

		Psychological demands		
		Low	High	
Decision latitude (control)	High	Low-strain	Active	Learning motivations to develop new behavior patterns
	Low	Passive	High-strain	
				Risk of psychological strain and physical illness

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Work stress

To measure work stress, the CCHS and NPHS used an abbreviated version of Karasek's Job Content Questionnaire (JCQ) (Karasek 1985). The CCHS measured work stress of respondents working at jobs or businesses in the past 12 months, while the NPHS measured work stress of those employed at the time of the survey. Twelve items in the JCQ are used to measure job control, psychological demands, job insecurity, physical exertion and workplace social support. Each item is scored using a five-point Likert scale from strongly agree to strongly disagree (items 4 and 7 are reverse scored):

Item	Subscale
1. Your job requires that you learn new things.	control
2. Your job requires a high level of skill.	control
3. Your job allows you freedom to decide how you do your job.	control
4. Your job requires that you do things over and over.	control
5. You have a lot to say about what happens in your job.	control
6. Your job is very hectic.	demands
7. You are free from conflicting demands that others make.	demands
8. Your job security is good.	job insecurity
9. Your job requires a lot of physical effort.	physical exertion
10. You are exposed to hostility or conflict from the people you work with.	social support

Job strain is only one stressor workers may face at the workplace. Physical exertion and job insecurity can also cause stress. Even in an era of increasing high-tech information industries, the physical demands of work are still relevant and important to many. Being seriously concerned about physical exertion of work can become a stressor. This is related to concerns about physical hazards and work injuries. Undoubtedly, uncertain job security and the fear of layoff is also an important source of psychological stress for some, especially during times of economic contraction (Williams 2003).

In addition, job satisfaction and self-perceived work stress can show different, yet important, aspects of job stress. Although these two may not identify specific sources of work stress, they show to what extent workers are dissatisfied with their jobs and perceive their daily work as stressful. Thus, many distinct sources and dimensions of work stress that could negatively

11. Your supervisor is helpful in getting the job done. social support
12. The people you work with are helpful in getting the job done. social support

Based on scores from the psychological demands and job control items, four psycho-social work conditions are identified: active (above median on both demands and control), high job strain (above median on demands, below median on control), low job strain (below median on demands, above median on control) and passive (below median on both demands and control). Respondents who disagreed or strongly disagreed with the security statement were classified as having job insecurity. Respondents who agreed or strongly agreed with the physical exertion statement were classified as having physically demanding jobs. Respondents were classified as having low workplace social support if they either agreed or strongly agreed with the first social support statement, disagreed or strongly disagreed with the second, or disagreed or strongly disagreed with the third.

Additionally, respondents were asked if they were very, somewhat, not too or not at all satisfied with their jobs. Those not too satisfied or not at all satisfied were classified as having job dissatisfaction. Self-perceived work stress at the main job or business in the past 12 months was measured by asking: "Would you say that most days at work were: not at all stressful? not very stressful? a bit stressful? quite a bit stressful? extremely stressful?" Respondents answering quite a bit or extremely were classified as having high self-perceived work stress.

affect some people can be identified. This article investigates levels, sources and effects of work stress for different socio-demographic and occupational groups.

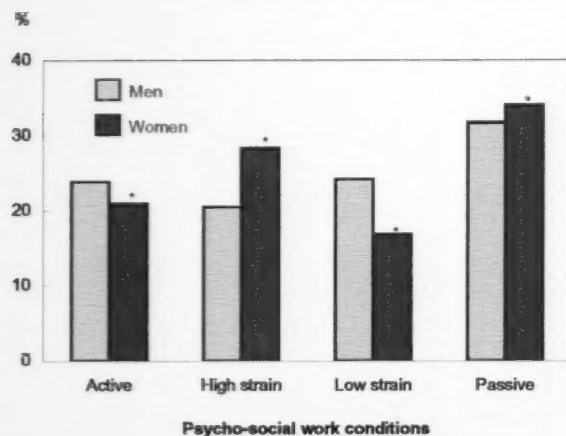
The 2002 Canadian Community Health Survey (CCHS) and various cycles of the National Population Health Survey (NPHS) are used to examine work stress and its effect on Canadian workers (see *Data sources*). First, the article describes work stress levels of employed persons aged 15 to 75 by selected characteristics. Second, cross-sectional and longitudinal analyses examine how work stress factors are associated with current and long-term productivity in terms of reduced work activities, disability days, and absence or separation from work. Multivariate techniques are used to control for employment characteristics and protective factors such as social support and individual coping behaviours (see *Job-related variables and Social support and coping behaviours*). Social support buffering

Data sources

The cross-sectional analysis on work stress is based on the Canadian Community Health Survey (CCHS): Mental Health and Well-being, which was introduced in May 2002 and conducted over eight months. The survey covered almost 37,000 people aged 15 or older living in private dwellings in the 10 provinces. Most interviews (86%) were conducted in person; the remainder, by telephone. Respondents were required to provide their own information—proxy responses were not accepted. The survey response rate was 77%.

The longitudinal analysis is based on the National Population Health Survey (NPHS). The NPHS, which began in 1994/95, collects information about the health of Canadians every two years. It covers household and institutional residents in all provinces and territories. In 1994/95, about 20,000 respondents were selected for the longitudinal panel. The response rate for this panel in 1994/95 was 86.0%. Attempts were made to re-interview these respondents every two years. The response rates for subsequent cycles, based on the original respondents, were 92.8% for cycle 2 (1996/97), 88.3% for cycle 3 (1998/99), 84.8% for cycle 4 (2000/01), 80.5% for cycle 5 (2002/03), and 77.4% for cycle 6 (2004/05). This analysis uses the cycle 6 longitudinal square file, which contains all responding members of the original panel regardless of whether information was obtained in all subsequent cycles.

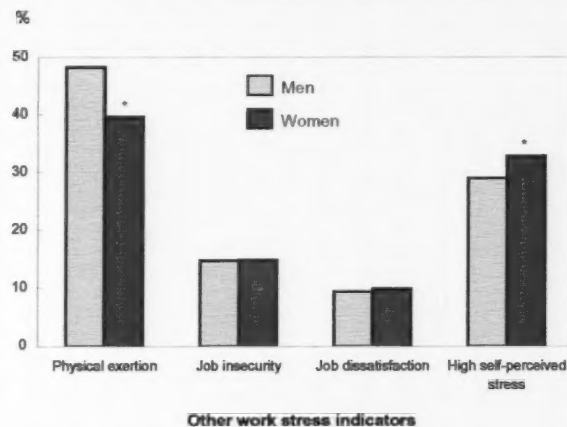
Chart A More employed women reported high job strain than men



* significantly different from men

Note: Employed population 15 to 75, Canada excluding Territories.
Source: Statistics Canada, Canadian Community Health Survey, cycle 1.2, 2002.

Chart B Employed women were more likely to report high work stress



* significantly different from men

Note: Employed population 15 to 75, Canada excluding Territories.
Source: Statistics Canada, Canadian Community Health Survey, cycle 1.2, 2002.

may depend on support from co-workers and supervisors as well as personal sources. Personal coping mechanisms may play an important role in controlling effects of work stress.

To account for survey design effects, the bootstrap technique was used to estimate coefficients of variation and p-values and to perform significance tests. The significance level was set at 0.05.

More work stress among women

Proportionately more employed women reported greater work stress than men—28% had high-strain and 17% had low-strain jobs, compared with 20% and 24%, respectively, for men (Chart A). Men were more likely to have active jobs than women. Small, but significant, differences were also found for self-perceived work stress (Chart B). One-third of women felt quite a bit or extremely stressed most days at work, compared with 29% of men. According to a multivariate analysis, employed women were 1.2 times more likely to report high self-perceived work stress, even after controlling for other socio-demographic and employment-related factors (data not shown).

Work stress and job performance

Table 1 Work stress indicators

	Psycho-social work conditions				Physical exertion	Job insecurity	Job dissatisfaction	High self-perceived work stress
	Active	High strain	Low strain	Passive				
					%			
Age								
15 to 24	8.1*	28.0 ^(*)	14.2 ^(*)	49.7*	52.8*	13.4	14.4 ^(*)	21.1*
25 to 39	26.1	24.6	21.4	28.0	44.2	15.6	10.4*	32.0*
40 to 54 (ref)	27.5	23.7	21.3	27.4	42.1	15.2	7.8	35.8
55 to 64	21.1*	19.5 ^(*)	26.1*	33.3*	38.5 ^(*)	13.2	5.6 ^(*)	29.2*
65 and over	13.6*	10.2 ^{(*)E}	32.5*	43.8*	31.0*	11.2 ^E	3.9 ^(*)	14.7*
Personal income								
Less than \$20,000	9.4*	27.6*	13.6*	49.4*	51.9*	19.4*	13.3*	22.2*
\$20,000 to \$59,999	22.9*	25.5*	22.3 ^(*)	29.4*	44.3*	13.7*	9.0*	32.3*
\$60,000 or more (ref)	34.8	18.0	24.9	22.3	36.4	11.8	5.0	36.0
Education¹								
Less than high school graduation	12.1*	24.4 ^(*)	16.7*	46.8*	63.0*	13.9	8.8	26.0*
High school diploma	19.0*	27.8*	17.0*	36.2*	49.3*	13.2*	8.3	29.7*
Some college/university	20.1*	25.5 ^(*)	21.5*	33.0*	41.1*	17.3	8.8	29.6 ^(*)
Bachelor's or higher (ref)	31.9	21.2	25.4	21.5	35.1	15.6	8.4	36.0
Marital status¹								
Married (ref)	26.4	22.3	23.2	28.2	42.0	13.9	7.6	33.0
Never married	23.7*	26.0 ^(*)	20.3*	30.0	43.4	18.7*	12.5*	30.1*
Divorced, separated, widowed	24.7	26.8 ^(*)	17.8*	30.8	42.6	18.9*	9.7*	37.0 ^(*)
Student status								
Yes	11.8 ^(*)	26.2 ^(*)	15.3 ^(*)	46.6 ^(*)	45.4	14.3	14.1 ^(*)	23.4 ^(*)
No (ref)	24.3	23.7	21.7	30.3	44.0	14.8	8.8	32.0
Shift work								
Yes	16.2*	29.4*	16.4*	38.1 ^(*)	54.4*	15.3	11.5*	28.7 ^(*)
No (ref)	25.3	21.7	22.7	30.3	39.5	14.4	8.7	31.5
Self-employment								
Yes	28.1*	13.7*	34.1*	24.2*	46.0	17.8*	4.8*	29.5
No (ref)	21.3	26.2	18.1	34.4	43.9	14.1	10.5	30.9
Full-time work								
Yes	25.5*	23.8	21.7 ^(*)	29.0*	44.3*	14.2 ^(*)	9.4	33.0*
No (ref)	8.4	25.2	15.9	50.5	43.5	16.6	10.8	19.4
Occupation								
White-collar (ref)	34.6	20.0	25.2	20.2	24.9	13.4	7.7	38.1
Sales and service	10.9*	31.1*	13.8*	44.3*	50.0*	15.4 ^(*)	13.0*	25.9*
Blue-collar	12.3*	24.5*	19.5*	43.7*	72.8*	15.0	10.7*	23.3*

* significantly different from reference group (ref) ($p < 0.05$); ^(*) no longer significant after controlling for sociodemographic and employment factors

1. Excludes those aged 15 to 24.

Note: Employed population 15 to 75, Canada excluding Territories.

Source: Statistics Canada, Canadian Community Health Survey, cycle 1.2, 2002.

A higher proportion of men reported that their jobs required a lot of physical effort—48% versus 40%. However, the significance of these findings disappeared after controlling for other socio-economic and employment variables. This may be associated with

men's employment in blue-collar jobs. Job insecurity was the same for both men and women: about 15% reported a high amount. Similarly, the level of job dissatisfaction was equal (about 1 in 10).

Age differences

Compared with other age groups, core-age workers (aged 25 to 54), most likely at the peak of their careers, were more likely to be in active jobs and less likely to be in passive jobs (Table 1). Those aged 40 to 54 were most likely to perceive their work as stressful.

Almost half of young workers (aged 15 to 24) were in passive jobs, a significantly higher rate than their core-aged counterparts, even after controlling for other factors, including student status. More than half of young workers also reported physical exertion in their jobs. Interestingly, however, these younger workers were less likely to perceive their work days as stressful. This may be because they realize that their current jobs are not their long-term careers.

About a third of older workers (aged 65 or older) tended to have relaxed (low-strain) jobs. Also, less than 4% expressed dissatisfaction with their jobs. Many may be semi-retired or part-time workers returning to work after retirement.

Even after controlling for related factors such as work hours, student status or shift work, most of these age differences remained significant.

Socio-economic status matters

Individuals with low personal incomes were more likely to have high-strain or passive jobs than individuals with high incomes. Almost half of workers with incomes of less than \$20,000 had passive jobs compared with only about one in five workers with \$60,000 or more. A larger proportion of individuals with low incomes reported higher job insecurity and job dissatisfaction. This may be partly because they were less likely to have permanent or unionized jobs.¹ Also, they tended to have more physically demanding jobs than people with higher incomes. Individuals in the highest income group were more likely to have active and low-strain jobs due to greater job control—however, they tended to perceive their work as more stressful. Not surprisingly, psychological demands from work were highly correlated with self-perceived work stress ($r = 0.35$). However, job control and self-perceived work stress were positively associated as well—almost half of workers with active jobs expressed high self-perceived work stress, a higher rate than workers with high-strain jobs (41%) (data not shown).

Similar patterns were found for education levels. Individuals with more education were more likely to have low-strain, active, and less physically demanding jobs

than workers with less education. For example, one in four workers with a university degree had a low-strain job compared with only one in six workers with less than high school graduation. Finally, as with income, workers with the most education were more likely to perceive their work as more stressful than workers with less education.

Married workers were more likely to have active and lower-strain jobs than never-married workers. They also had significantly lower rates of job insecurity and job dissatisfaction than those never or previously married. For some aspects of work stress, however, other factors appeared more important than marriage. For instance, although a much higher proportion of divorced, separated or widowed women reported high self-perceived work stress than married women, the difference was not statistically significant when other factors were controlled for.

Work stress and job-related variables

Shift workers were more likely to have high-strain jobs than other workers (29% vs. 22%). They had higher levels of psychological demands and lower levels of job control. Furthermore, compared with regular-schedule workers, shift workers were more likely to perceive their jobs as physically demanding (54% vs. 40%) and less satisfying (12% vs. 9%). These findings are consistent with previous research indicating poorer general health and higher levels of work stress among shift workers (Harrington 2001; Shields 2006). Shift workers' stress may result from lack of socializing with

Job-related variables

Occupation was collapsed into three groups: white-collar (management; professional; technologist, technician or technical occupation; and administrative, financial or clerical), sales or service, and blue-collar (trades, transport or equipment operator; farming, forestry, fishing or mining; and processing, manufacturing or utilities).

Shift work refers to anything other than a regular daytime schedule (evening, night, rotating or split shifts).

The self-employed are those who worked mainly in their own businesses or professional practices, or on their own farms.

Those working 30 or more hours a week at their main jobs were considered full-time.

For respondents with more than one job, classifications were based on the one with the most weekly hours (main job).

Social support and coping behaviours

The emotional and informational support variable in the 2002 CCHS used an abridged version of measures in the Medical Outcomes Study (MOS). Respondents were asked: "How often is each of the following kinds of support available to you if you need it? Someone:

- you can count on to listen when you need to talk?"
- to give you advice about a crisis?"
- to give you information in order to help you understand a situation?"
- to confide in or talk to about yourself or your problems?"
- whose advice you really want?"
- to share your most private worries and fears with?"
- to turn to for suggestions about how to deal with a personal problem?"
- who understands your problems?"

Each item was scored from 0 (none of the time) to 4 (all of the time). Social support was considered a continuous variable, with a score ranging from 0 to 32.

In the NPHS, perceived emotional social support was measured by four yes or no questions in cycles 1 and 2, and by the above questions in cycles 3 to 5. The cycle 1 and 2 questions were:

- "Do you have someone you can talk to about your private feelings or concerns?"
- "Do you have someone you can really count on in a crisis situation?"
- "Do you have someone you can really count on to give you advice when you are making important personal decisions?"
- "Do you have someone who makes you feel loved and cared for?"

Respondents had low emotional social support if they answered no to at least one question. In cycles 3 to 5, respondents answering none of the time or a little of the time to any of the eight questions were considered to have low emotional/social support.

The CCHS asked all respondents how they coped with stress. It also asked how often (often, sometimes, rarely or never) they used each of 14 methods:

1. try to solve the problem
2. talk to others
3. avoid being with people
4. drink alcohol more than usual
5. smoke more cigarettes than usual

6. use drugs or medication
7. eat more or less than usual
8. sleep more than usual
9. pray or seek spiritual help
10. jog or other exercise
11. relax by doing something enjoyable
12. blame yourself
13. wish the situation would go away or somehow be finished
14. try to look on the bright side of things

The negative coping behaviours (3 to 8, 12, 13) and positive behaviours (1, 2, 9 to 11, 14) were identified by exploratory factor analysis. Chronbach's alpha of negative coping was 0.60 and that of positive coping 0.51. A response of often or sometimes was considered as use of a coping behaviour.

The NPHS measured heavy drinking by asking respondents how often they had had 5 or more alcoholic drinks on one occasion in the past year; having done so at least once a month (or 12 or more times in the past year for cycle 1) was classified as heavy monthly drinking.

Daily smokers were those who smoked cigarettes every day.

Obesity was based on a body mass index (BMI) of 30 or more for people aged 18 or older. Age/sex specific cut-offs were used to classify the BMIs of people under age 18 (Cole et al. 2000).

Physical activity was based on total accumulated energy expenditure (EE) during leisure time, calculated from the reported frequency and duration of all leisure-time physical activities in the three months before the interview and the metabolic energy demand (MET) of each activity, which was independently established (Statistics Canada 1995; Stephens et al. 1986).

$EE = S(N_i \cdot D_i \cdot MET_i / 365 \text{ days})$, where

N_i = number of occasions of activity i in a year,

D_i = average duration in hours of activity i , and

MET_i = a constant value for metabolic energy cost of activity i .

For each respondent, daily EE was the sum of energy expenditures of all leisure-time activities, expressed as total kilocalories expended per kilogram of body weight per day (K/K/D). An EE of 3 or more K/K/D was defined as high; 1.5 to 2.9, moderate; and less than 1.5, low (Statistics Canada 1995). Respondents with high or moderate EE were considered physically active; those with low EE, inactive.

family and friends, difficulty planning for family responsibilities, taking part in regular job activities or forming routines (Occupational Health Clinics for Ontario Workers 2005). It may also be related to the health effects shift work causes, such as disruption of circadian rhythm, reduction in quality and quantity of sleep, fatigue, anxiety, depression and increased neuroticism (Harrington 2001).

Being one's own boss should bring the ultimate control over work. In fact, job strain was significantly less prevalent among the self-employed: 14% had high-strain jobs compared with 26% of other workers. Almost 30% had active jobs. More than one in three self-employed workers had low-strain jobs. They also tended to be satisfied with their work—only 5% reported job dissatisfaction, significantly less than employees (11%). However, almost one in five self-employed workers felt their jobs were not secure. Unlike employees, who are paid even when business is slow, self-employed workers must market and promote their businesses in order to generate earnings. They are especially concerned about job security since they do not qualify for benefits or overtime, vacation or severance pay.

Since part-time employment often includes temporary, casual and term arrangements, it is not too surprising to find that full-time workers were much more likely to have active jobs than part-time workers (26% vs. 8%). That is, full-timers had greater psychological demands and more job control at the workplace. More than half of part-time workers were low in both job control and psychological demands (passive jobs). In contrast, full-time workers were more likely to perceive their work days as stressful. Overall, full-time workers were slightly more likely to perceive their jobs as requiring a lot of physical effort.²

A more in-depth analysis of work hours found that those working more than 40 hours a week were less likely than regular or part-time workers to have high-strain jobs and most likely to have active jobs.³

In general, white-collar workers had significantly higher levels of decision latitude than the other occupational groups (blue-collar, and sales and service). More than a quarter had low-strain jobs. And, white-collar workers were more likely to have active jobs—more than a third compared with about one-tenth of other workers. Since many blue-collar jobs involve manual labour, it is not surprising that a high proportion of blue-collar workers (73%) perceived their work as

physically demanding. Finally, a higher proportion of white-collar workers reported a high level of job satisfaction compared with other workers, but they were also more likely to perceive their work as stressful.

Multivariate analysis

To examine how work stress factors are associated with productivity, multivariate logistic regression models were developed. Models were first run for each of the four work-stress conditions⁴ to test for associations with selected job performance outcomes—reduced activities at work, at least one disability day in the past two weeks, and being absent in the past week. These models controlled for possible confounders: occupation, hours, shift work, self-employment, age, marital status, education and income. In the second step, the models were re-run to include a set of mitigating factors that could potentially protect against outcomes associated with work stress. These factors included co-worker support, emotional support, and positive and negative coping behaviours. To control for likely correlations and interactions, separate regression analyses for each source of work stress were run for the first two sets of models. Finally, in the third model, all work stress-related factors were controlled for simultaneously, in addition to all other confounding and protective variables. Since these multivariate analyses were based on cross-sectional data, neither causality nor temporal ordering can be inferred.

Reduced work activities due to long-term health issues

Workers with high-strain jobs were more likely than those with low-strain jobs to report reduced work activities due to a long-term health problem.⁵ The odds ratio for men was 1.7; for women, 1.6 (Table 2). For men, an active job was also associated with reduced work activities, while highly physical jobs and job insecurity were for both sexes. When social support and coping factors were accounted for, however, most associations with reduced work activities were no longer significant, with the exception of physical exertion among women and self-perceived work stress for both sexes. In other words, a supportive environment both at and away from work may help prevent reduced work activities by mitigating the effects of work-related stress. But, those relying on negative coping mechanisms are at risk of reduced activities. Detailed findings show that, for men, high workplace social co-worker support was associated

Table 2 Reduced activity at work due to a long-term health problem

	Men, controlling for				Women, controlling for			
	Prevalence	Employment and personal factors ¹	Employment, and personal ¹ and protective factors ²		Prevalence	Employment and personal factors ¹	Employment, and personal ¹ and protective factors ²	
		Sepa- rately	Sepa- rately	Com- bined		Sepa- rately	Sepa- rately	Com- bined
	%		Odds ratio		%		Odds ratio	
Psycho-social work conditions								
Active	10.0	1.37*	1.22	1.14	10.1	1.08	0.99	0.91
High strain	13.2*	1.69*	1.29	1.21	14.9*	1.60*	1.35	1.25
Low strain (ref)	8.2	1.00	1.00	1.00	9.9	1.00	1.00	1.00
Passive	10.5	1.26	1.16	1.16	9.6	0.93	0.86	0.87
Physical exertion								
Yes	12.0*	1.24*	1.16	1.16	13.5*	1.34*	1.35*	1.29*
No (ref)	8.9	1.00	1.00	1.00	9.8	1.00	1.00	1.00
Job insecurity								
Yes	13.1*	1.29*	1.05	1.00	13.4*	1.24*	0.98	0.94
No (ref)	9.9	1.00	1.00	1.00	10.9	1.00	1.00	1.00
High self-perceived work stress								
Yes	13.6*	1.73*	1.45*	1.42*	14.3*	1.64*	1.42*	1.35*
No (ref)	9.0	1.00	1.00	1.00	9.7	1.00	1.00	1.00

* significantly different from reference group (ref) ($p < 0.05$)

1. Age, personal income, education level, marital status, student status, shift work, self-employment, full-time work and occupation.

2. Co-worker or emotional support and positive or negative coping behaviours.

Note: Employed population 15 to 75, Canada excluding Territories.

Source: Statistics Canada, Canadian Community Health Survey, cycle 1.2, 2002.

with a lower likelihood of reduced work activities, for women, it was high emotional and informational support. For both sexes, negative coping behaviours (for example, drinking alcohol, smoking or drug use) were associated with reduced activities at work (see *Social support and coping behaviours*).

Disability days in the last two weeks

In the CCHS, currently employed respondents had a disability day in the past two weeks if they stayed in bed all or most of the day (including nights in hospital), cut down on normal activities, or required extra effort in their daily activities because of illness or injury.

Men with active or high-strain jobs were 1.5 times more likely than those with low-strain jobs to report at least one disability day during the last two weeks (Table 3). This difference may not represent merely different levels of psychological demands. In a more in-depth analysis with active job as the reference group, the likelihood of men taking disability days in active

jobs was higher than for passive workers (data not shown). Being an active worker with high job control along with high psychological demands is associated with short-term work interruptions like disability days. With protective factors accounted for, however, the statistically significant associations of some work stress sources (physical exertion for men and high-strain jobs for women) to disability days disappeared. As with reduced work activities, detailed findings revealed that negative coping behaviours tended to increase the likelihood of disability days for both sexes.

High self-perceived work stress was strongly related to taking disability days. Almost one in five men and women who perceived their regular work days to be stressful took at least one disability day in the last two weeks. The association was significant in all models but one. When all work stress indicators were included, the association was no longer significant for women. This suggests that different sources of work stress do not occur in isolation but indeed interact with one another (Shields 2006).

Table 3 Disability day in the last two weeks

	Men, controlling for				Women, controlling for			
	Prevalence	Employment and personal factors ¹	Employment, and personal ¹ and protective factors ²		Prevalence	Employment and personal factors ¹	Employment, and personal ¹ and protective factors ²	
		Separately	Separately	Combined		Separately	Separately	Combined
	%	Odds ratio			%	Odds ratio		
Psycho-social work conditions								
Active	16.2*	1.53*	1.47*	1.39*	17.7	1.07	1.00	0.98
High strain	17.2*	1.54*	1.38*	1.33*	20.9*	1.30*	1.10	1.07
Low strain (ref)	11.3	1.00	1.00	1.00	15.9	1.00	1.00	1.00
Passive	11.7	1.01	0.98	0.98	16.7	0.98	0.91	0.93
Physical exertion								
Yes	15.0*	1.15	1.13	1.10	19.3	1.16	1.14	1.13
No (ref)	12.7	1.00	1.00	1.00	17.1	1.00	1.00	1.00
Job insecurity								
Yes	14.0	0.96	0.86	0.82	19.3	1.12	0.99	0.96
No (ref)	13.8	1.00	1.00	1.00	17.8	1.00	1.00	1.00
High self-perceived work stress								
Yes	17.2*	1.52*	1.39*	1.31*	20.0*	1.33*	1.16*	1.14
No (ref)	12.4	1.00	1.00	1.00	17.0	1.00	1.00	1.00

* significantly different from reference group (ref) ($p < 0.05$)

1. Age, personal income, education level, marital status, student status, shift work, self-employment, full-time work and occupation.

2. Co-worker or emotional support and positive or negative coping behaviours.

Note: Employed population 15 to 75, Canada excluding Territories.

Source: Statistics Canada, Canadian Community Health Survey, cycle 1.2, 2002.

Absence from work

The CCHS asked: "Last week, did you have a job or business from which you were absent?" For this study, those who reported an absence from work and indicated own illness or injury as the primary reason were considered to be absent from work due to a health problem.⁶

A physically demanding job turned out to be an important factor for work absence for both men and women. Those who reported a lot of physical effort were about twice as likely to be absent from work. For example, men in physical jobs were 2.2 times more likely to have a work absence than those in non-physical jobs; for women, the odds ratio was 1.9 (Table 4). This result is consistent with previous research suggesting significant associations between sickness absence and physical load, and risk factors in the work environment (Lund et al. 2006; von Thiele et al. 2006).

Women with high self-perceived work stress were more likely than those without such stress to be absent from work. For men, however, self-perceived work stress and work absence were not significantly associated. Detailed analyses showed social support and positive coping behaviours (problem solving, physical exercise, being positive, etc.) did help to reduce the likelihood of work absence for women, whereas negative coping (drinking, smoking, drug use, etc.) increased the likelihood of women being absent from work.

Longitudinal effects of work stress

Longitudinal analysis is especially useful for work stress since it could reveal long-term cumulative effects of stress and clearer causal relationships between stress and job performance. Because some variables were not available, or were measured differently in the

Table 4 Work absence due to a health problem

	Men, controlling for				Women, controlling for			
	Employment and personal factors ¹		Employment, and personal ¹ and protective factors ²		Employment and personal factors ¹		Employment, and personal ¹ and protective factors ²	
	Prevalence	Separately	Separately	Combined	Prevalence	Separately	Separately	Combined
	%		Odds ratio		%		Odds ratio	
Psycho-social work conditions								
Active	0.8 ^E	0.51	0.45	0.43	1.6 ^E	1.10	0.93	0.73
High strain	1.4 ^E	0.64	0.56	0.54	2.7*	1.54	1.24	1.02
Low strain (ref)	F	1.00	1.00	1.00	1.3 ^E	1.00	1.00	1.00
Passive	0.9 ^E	0.40	0.39	0.41	1.7 ^E	0.92	0.83	0.83
Physical exertion								
Yes	1.7 ^{E*}	2.20*	2.03*	2.00*	2.8*	1.93*	1.86*	1.71*
No (ref)	0.6 ^E	1.00	1.00	1.00	1.2	1.00	1.00	1.00
Job insecurity								
Yes	0.7 ^E	0.68	0.63	0.60	1.9 ^E	1.03	0.87	0.80
No (ref)	1.2 ^E	1.00	1.00	1.00	1.9	1.00	1.00	1.00
High self-perceived work stress								
Yes	1.3 ^E	1.49	1.25	1.41	3.0*	2.39*	2.11*	2.05*
No (ref)	1.0 ^E	1.00	1.00	1.00	1.3	1.00	1.00	1.00

* significantly different from reference group (ref) ($p < 0.05$)

1. Age, personal income, education level, marital status, student status, shift work, self-employment, full-time work and occupation.

2. Co-worker or emotional support and positive or negative coping behaviours.

Note: Employed population 15 to 75, Canada excluding Territories.

Source: Statistics Canada, Canadian Community Health Survey, cycle 1.2, 2002.

NPHS, the longitudinal models differ slightly from the corresponding CCHS-based cross-sectional models. For example, smoking, drinking alcohol, physical activity and BMI variables were used in the longitudinal models as rough proxies of the coping behaviour available from the CCHS.

The long-term effects of work stress on job performance were examined by using repeated observations over two-year periods. Pooling of repeated observations was combined with logistic regression analysis. Three cohorts of pooled observations were used, with baseline years of 1994/95 (cycle 1), 2000/01 (cycle 4) and 2002/03 (cycle 5). Each cycle had questions on work stress. For each baseline year, employed persons aged 15 to 75 (15 to 54 for the model for being out of labour force) were selected for analysis.

Reduced activities at work two years later

Only workers reporting no reduced work activities in the baseline were included for analysis. The NPHS asked current workers: "Because of a long-term physi-

cal or mental condition or a health problem, are you limited in the kind or amount of activity you can do at work?" Those answering yes in the follow-up survey two years later were considered to have reduced activities at work.⁷

Workers with active jobs were twice as likely as those with low-strain jobs to have reduced work activities two years later, even after controlling for various confounding factors, including social support and coping behaviours (Table 5). This is not consistent with the assumption that active jobs create the context of growth and learning conducive to high productivity (Karasek 1998). Being in active jobs may raise current productivity, but working under high demands and high responsibility (control) may cost workers health and productivity later.

As well, physical exertion appeared to increase the long-term likelihood of reducing work activities. Both men and women who worked in physically demanding jobs were around 1.6 times more likely

Table 5 Longitudinal labour force outcomes, over a two-year period

	Men			Women		
	Reduced activity at work	Disability day	Out of labour force	Reduced activity at work	Disability day	Out of labour force
Odds ratio						
Psycho-social work conditions						
Active	2.01*	1.39	0.66*	2.08*	1.36	0.87
High strain	2.29*	2.02*	0.87	1.72	1.06	0.80
Low strain (ref)	1.00	1.00	1.00	1.00	1.00	1.00
Passive	1.53*	1.39	0.94	1.37	1.20	1.04
Physical exertion						
Yes	1.60*	1.05	0.93	1.67*	0.90	1.02
No (ref)	1.00	1.00	1.00	1.00	1.00	1.00
Job Insecurity						
Yes	1.10	0.85	1.45*	1.12	1.03	1.33*
No (ref)	1.00	1.00	1.00	1.00	1.00	1.00

* significantly different from reference group (ref) ($p < 0.05$)

Note: Employed population 15 to 75, Canada excluding Territories.

Source: Statistics Canada, National Population Health Survey, 1994/1995, 2004/2005.

than those in other jobs to reduce their work activities two years later. Men with passive or high-strain jobs were more likely than workers with low-strain jobs to reduce work activities two years later, suggesting that these types of work stress may have contributed to long-term health problems that eventually affect productivity.

Disability days two years later

Men with high-strain jobs in the baseline year were more likely to take disability days two years later.⁸ They were twice as likely as men with low-strain jobs to have disability days even after controlling for socio-demographic, employment and social support factors (Table 5).

As with reduced work activities, workers hit hardest by work stress may already have left the labour force and so were not included for analysis. Disability days may be affected more by concurrent conditions than longitudinal ones, as the concept focused on short-term effects such as staying in bed, cutting down on normal activities, or requiring extra effort for daily activities, whereas reduced work activities measured results from long-term health conditions.⁹

Being out of labour force two years later

Those working in the baseline survey but not two years later were considered as being out of labour force. To minimize the potential effect of retirement,

the analysis of out of the labour force was limited to workers aged 15 to 54.

Not surprisingly, workers who perceived their jobs to be less secure were more likely not to be in labour force two years later. The odds ratios were 1.5 for men with job insecurity and 1.3 for women, after controlling for various confounding factors (Table 5). Men with active jobs were more likely to remain in the labour market than men with low-strain jobs. While these findings are generally consistent with previous research reporting that job stress is a very important determinant of intentions to quit (Leontardi and Ward 2002), this analysis could not provide information on the reasons for leaving the labour market.

Conclusion

The negative implications of work stress are recognized as a challenge to both employers and workers, with women, youth, shift, part-time, and non white-collar workers being more likely to have high-strain jobs. Those with such jobs perceived their work to be physically demanding and less satisfying. Low personal incomes and low levels of education were also associated with higher stress.

Work stress can be measured by several indicators. As a result, some variables can at times show differing types of associations with various population groups.

In particular, self-perceived work stress often had a seemingly inverse relationship to other indicators of work stress. For example, white-collar workers were more likely than others to have low job strain and high job satisfaction, yet they also had higher levels of self-perceived work stress. Groups with high self-perceived work stress included middle-aged, married, high income, and high education. It seems workers were more likely to find their work stressful when it was based on their perceived responsibility rather than job strain or dissatisfaction.

Work stress factors have significant cross-sectional and longitudinal associations with job performance. For example, high job strain was associated with reduced activities at work and taking at least one disability day during the previous two weeks; active jobs were also positively associated with taking disability days; and physically demanding work was related to absence from work in the past week. Physically demanding work was associated with reduced activities two years later; active jobs were associated with reduced work activities; and self-perceived job insecurity was associated with subsequent non-employment.

Social support and positive coping mechanisms are protective factors for workers. Many associations between work stress indicators and job performance were mitigated by such factors. On the other hand, negative coping behaviours were likely to increase work impairments. Effective promotion of protective elements and reduction of negative behaviours, on and off the job, may help lessen the effects of work stress on reduced work activities, disability days and work absences.

Perspectives

■ Notes

- 1 Information on union membership and job permanency was not available in the 2002 CCHS or the NPHS.
- 2 Further analysis revealed an interesting difference between men and women in the relationship between work hours and physical exertion: among men, full-timers were more likely to perceive their jobs as physically demanding; whereas among women, this was the case for part-timers (data not shown).
- 3 This finding is inconsistent with previous research that has shown that extended work hours increased work stress especially when combined with shift work (NIOSH 2004; van der Hulst and Geurts 2001).

4 Job dissatisfaction was not included in the regression models due to its close association with self-perceived work stress (cf. Shields 2006).

5 Reduced work activities in the CCHS were based on a response of often or sometimes (versus never) to: "Does a long-term physical or mental condition or health problem reduce the amount or kind of activities you can do at work?"

6 Because of this specific definition, only 85% of the original study population was included: those who did not work due to a permanent disability or lack of a job (possibly caused by illness or injury) were excluded. As well, since those who worked, regardless of hours or types of work, were counted as present, a very low rate of work absence (1.4%) was found. This prevented a full analysis of some issues, and may have precluded statistically significant findings that would have emerged had the sample been larger.

7 Since this analysis could not include workers who might already have left work due to severe effects of work stress during the survey intervals, some work stress effects would not be captured here.

8 Only workers who took no disability days in the baseline survey were included.

9 Unfortunately, the NPHS does not have disability indicators with a longer reference period (e.g. the number of disability days taken in the past year). Such indicators may be more relevant to the measurement of longitudinal effects of work stress.

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